Claims

[c1] 1. A method for controlling reductant injection in an exhaust system of an engine having an upstream oxidation catalyst and a downstream lean NOx catalyst, the method comprising:

determining an amount of NOx exiting the upstream oxidation catalyst;

calculating a ratio of NO to NO2 contained in said amount of exiting NOx;

calculating an amount of reductant to be injected based on said second amount of NOx and said ratio; and

adjusting a signal for controlling injected reductant based on said calculated amount of reductant to be injected.

[c2] 2. The method recited in Claim 1, wherein said determining said amount of exiting NOx comprises reading a NOx sensor value coupled in the exhaust gas upstream of said lean NOx catalyst and downstream of said oxidation catalyst.

[c3] 3. The method recited in Claim 1, wherein said calculating said ratio is based on engine operating conditions.

[c4] 4. The method recited in Claim 1, wherein said calculating said ratio is based on engine operating conditions, said engine operating condition being an engine feed gas NOx amount.

[c5] 5. The method recited in Claim 4, wherein said feed gas NOx amount is calculated based on engine speed and load.

[c6] 6. A system for an exhaust gas system of a diesel internal combustion engine, the system comprising:

an upstream oxidation catalyst for converting a portion of incoming NO into NO2;

a downstream lean NOx SCR catalyst for converting at least some of said NO and NO2 exiting said upstream oxidation catalyst into nitrogen in the presence of a reductant;

a reductant injection system coupled upstream of said lean NOx catalyst and downstream of said upstream oxidation catalyst;

a sensor coupled upstream of said lean NOx catalyst; and

a controller for determining an amount of NOx exiting the upstream oxidation catalyst, calculating a ratio of NO to NO2 contained in said amount of exiting NOx, and adjusting an amount of reductant to be injected by said reductant system based on said second amount of NOx and said ratio.

[c7] 7. The system recited in claim 6, wherein said controller further determines degradation of the upstream oxidation catalyst based on said ratio of NO to NO2.

[c8] 8. The system recited in Claim 6, wherein said sensor is a NOx sensor.

[c9] 9. The system recited in Claim 6, wherein said reductant includes urea.

[c10] 10. The system recited in Claim 6, wherein said reductant system includes a control valve that receives a signal from said controller.

[c11] 11. A method for treating exhausts gasses of an internal combustion engine, comprising:

combusting fuel containing sulfur;

maintaining a ratio of NO to NO2 in the exhaust gasses within 50% of a 1:1 ratio under predetermined operating conditions;

passing said maintained exhaust gasses, and a reductant, to a lean NOx catalyst in an engine exhaust; and

diagnosing degradation of the treatment of exhaust gasses based on a sensor that measures the exhaust gasses.

[c12] 12. The method recited in Claim 11, wherein said maintaining further comprises providing an upstream catalyst.

[c13] 13. The method recited in Claim 11, wherein said maintaining further comprises adjusting an exhaust gas recirculation amount of the engine.

[c14] 14. The method recited in Claim 11, wherein said reductant is urea.

[c15] 15. The method recited in Claim 11, wherein said predetermined operating conditions include engine speed, engine load, and temperature.

[c16] 16. A system for reducing exhaust gas NOx of a diesel internal combustion

engine, the system comprising:

a fueling system coupled to the engine for providing diesel fuel for combustion that includes sulfur;

an upstream oxidation catalyst for converting a first portion of incoming NO into NO2 in the combustion gas to provide an exiting NO to NO2 ratio of within 50% of a 1:1 molar ratio;

a downstream lean NOx SCR catalyst for converting said a second portion of NO and NO2 exiting said upstream oxidation catalyst in the presence of a reductant; and

a diagnostic system for determining degradation of at least one of said upstream oxidation catalyst and said downstream lean NOx SCR catalyst.

[c17] 17. The system recited in Claim 16, wherein said reductant is urea.

[c18] 18. The system recited in Claim 16, wherein downstream catalyst converts said NO and NO2 with the exhaust gas has a lean air-fuel ratio.

[c19] 19. The system recited in Claim 16, wherein said reductant is urea.

[c20] 20. The system recited in Claim 16, further comprising a first NOx sensor located downstream of said downstream lean NOx catalyst.

[c21] 21. The system recited in Claim 20, further comprising a second NOx sensor located between said upstream oxidation catalyst and said downstream lean NOx catalyst.

[c22] 22. The system recited in Claim 21, further comprising a diagnostic controller for determining whether said downstream catalyst is contaminated with sulfur based on said first and second NOx sensors.

[c23] 23. A system for reducing exhaust gas NOx of a diesel internal combustion engine, the system comprising:

a fueling system coupled to the engine for providing diesel fuel for combustion that includes sulfur;

an upstream oxidation catalyst for converting a first portion of incoming NO into NO2 in the combustion gas to provide an exiting NO to NO2 ratio

of within 50% of a 1:1 molar ratio; and

a downstream lean NOx SCR catalyst for converting said a second portion of NO and NO2 exiting said upstream oxidation catalyst in the presence of a reductant; and

a controller for determining an amount of reductant to be injected between said upstream and downstream catalyst based on an estimate of an actual NO to NO2 ratio.